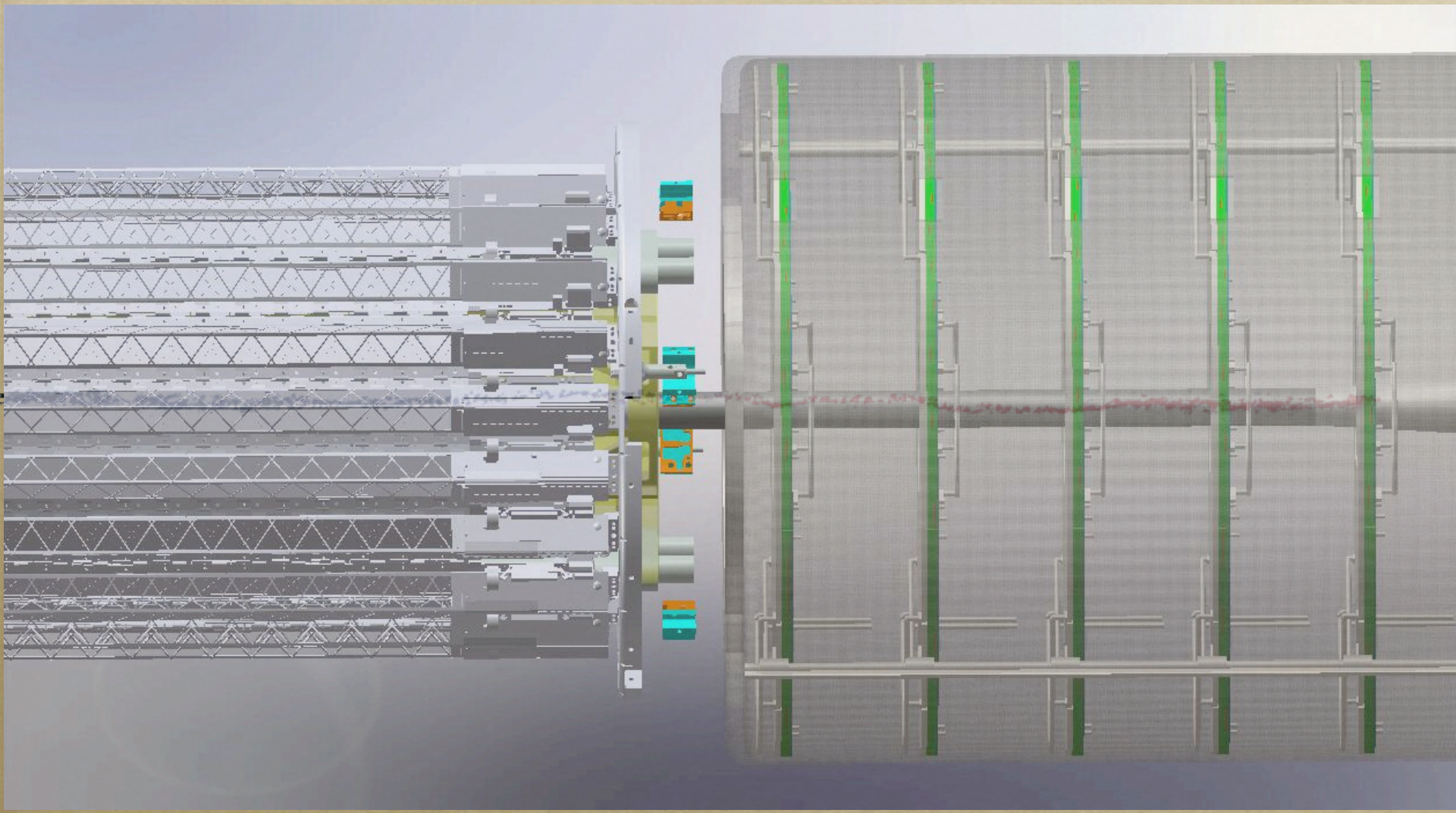
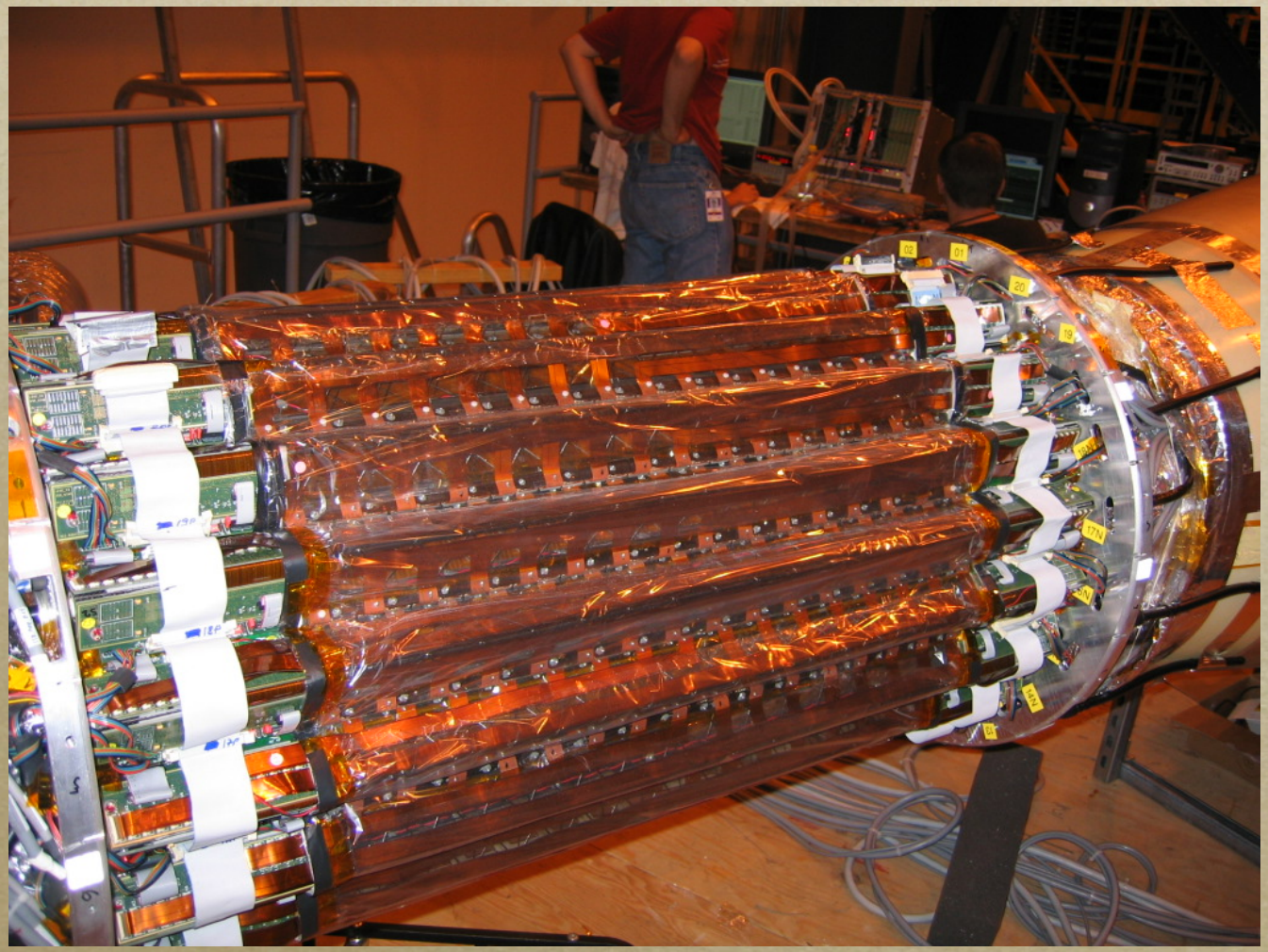
SSD Status



Davis Collaboration Meeting – June 17, 2008

Howard Matis

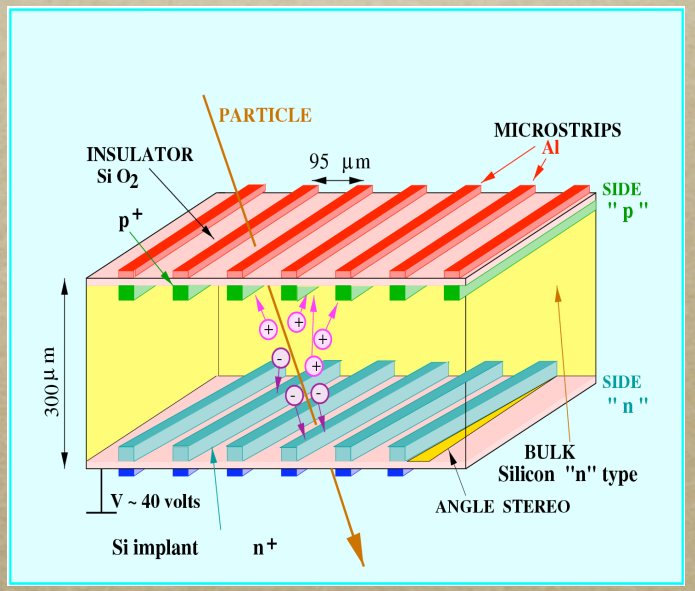
The SSD



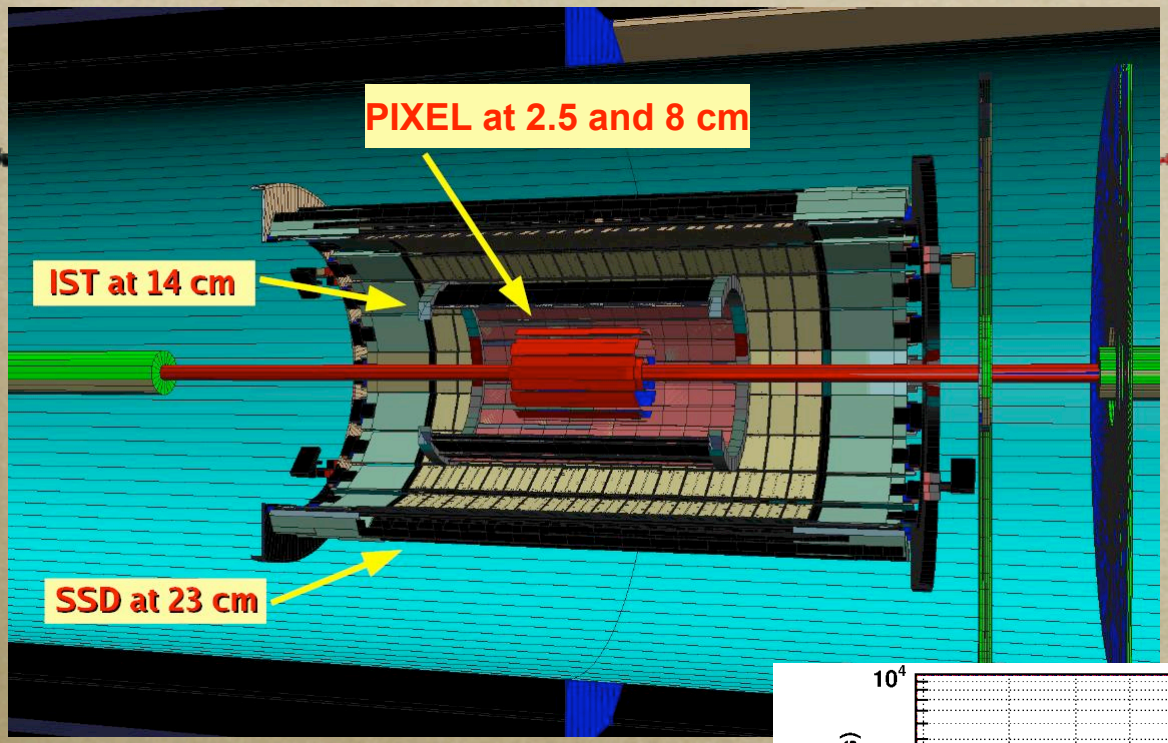
Acceptance: $-1.2<\eta<1.2 \quad 0<\varphi<2\pi$

Silicon Arrangement

- *20 ladders at r = 23 cm – 1% X_0*
- *16 silicon strip wafers per ladder*
- *Wafer is double sided silicon*
  - *42 mm × 73 mm*
  - *768 strips at angle of 35 mrad*
  - *Resolution is*
    - *20 μm in rϕ*
    - *740 μm in z*
  - *Shaping time is 1.2 – 2 μs*



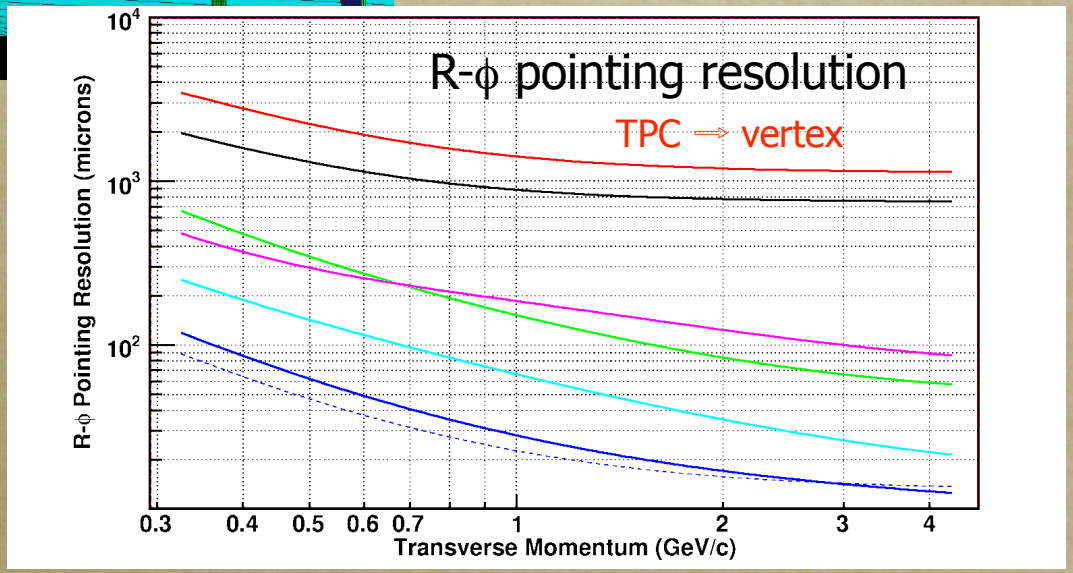
The SSD is needed for HFT Tracking



- Part of tracking package
- Graded resolution
- Hit matching from the outside → in

TPC ⇒ SSD
SSD ⇒ IST
IST ⇒ PIXEL2
PIXEL2 ⇒ PIXEL1
PIXEL1⇒ vertex

PIXEL alone



History

- *Run 4 - (2003-2004) Au+Au*
  - *Half of the SSD installed*
- *Run 5 - (2004-2005) Cu+Cu*
  - *Full detector in STAR*
  - *Data in analysis*
- *Run 6 (2006) - p+p*
  - *SSD removed from data stream*
- *Run 7 (2007) - Au + Au*
  - *SSD group reconstituted*
  - *In data stream*
- *Run 8 (2008)*
  - *Removed for low mass run*
  - *Moved to Nantes to refurbish and upgrade electronics*

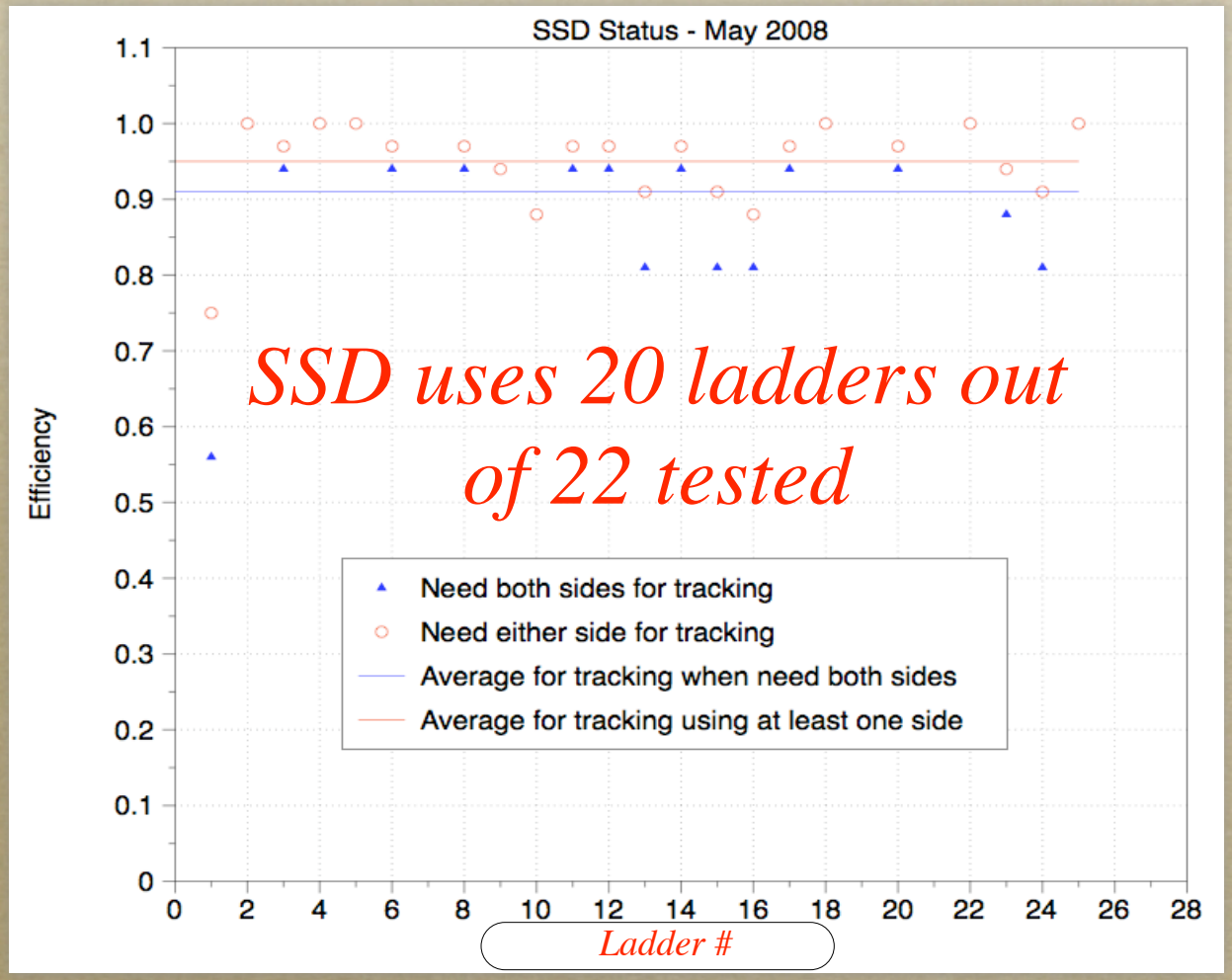
Current Hardware Situation

- *SSD operational in Nantes*
- *All ladders tested*
- *No dead ladders*
  - *Ladder 7 fixed by replacing ADC and connection board*
- *Preparing to upgrade to DAQ1000*

Recent Testing Results

- *22 ladders (need 20)*
  - *6 very good ladders*
  - *7 Ladders with one bad hybrid (half module)*
    - *Those ladders may be fully "good" if the bias of the module is forced.*
  - *9 Ladders with several bad modules*
    - *Some need to have the bias forced*
      - *Because of problem with JTAG chain, configuration cannot be done with present TEST software*
    - *Some improvement can be done on these ladders*
  - *4 with a real high voltage trip*
    - *Can be very good if capacitors replaced*
      - *Will result in 10 very good ladders when fixed*

Summary with NO repair



Comments

- *Each side of the SSD is read separately*
- *Really two separate detectors*
- *Currently STAR software requires both n side and p side for a track*
  - *Efficiency will improve if can allow only one side*
  - *Action item for STAR software*

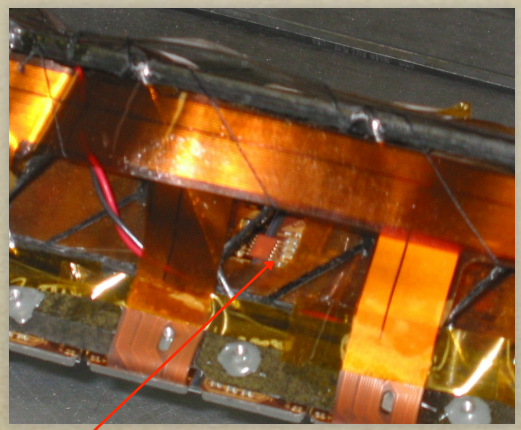
High Current on a few ladders

- *Capacitors are added to isolate power lines*
- *High current on a few modules probably due to bad capacitor*
- *Should be repairable*
- *Locate bad capacitors by infrared imagery*

Infrared scan

Bad Capacitor

Leaking Capacitor



Capacitor

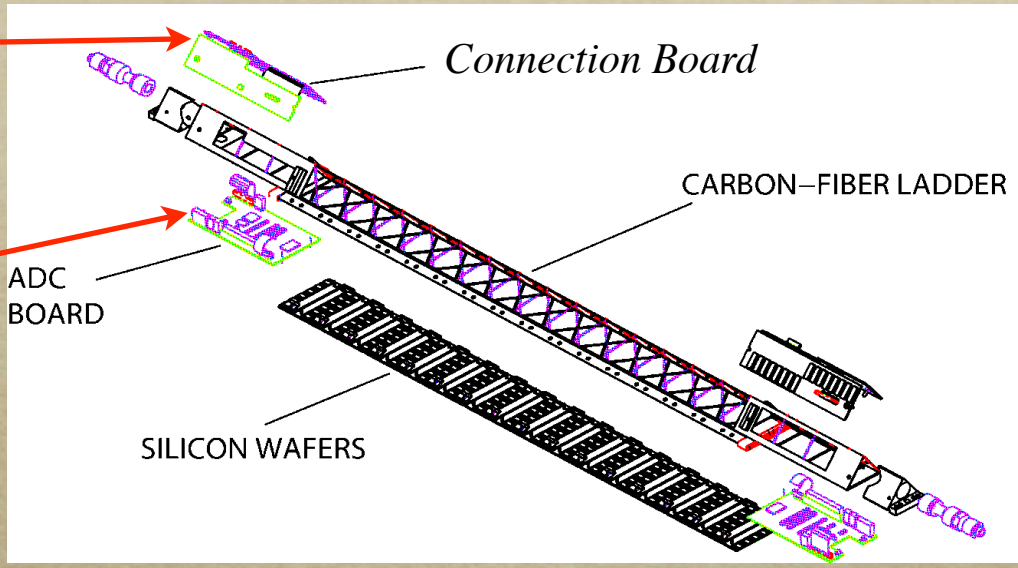
Developing tooling to remove bad ones

Upgrade Plan

- *Keep silicon*
- *Upgrade the SSD readout electronics from 200 Hz to 1 kHz*
- *Design a new slow controls system to be compatible with the new electronics*
- *Ensure that all cone modifications proposed for the FGT and HFT are compatible with the re-installation of the SSD*
- *Redesign and replace the cooling system*

Electronics upgrade

- *New connection board to merge the data from modules to the ADC*
- *Replace ADC board with a new high speed ADC*
- *Read ladders in parallel*
- *New RDO board to collect data from 5 ladders*
- *Send data to a PC via a DDL fiber link*
  - *160 MB/s*
  - *Need 8 RDOs and 8 DDL*



OUR Run Plan*

- *Run 10 – Installation during summer 2009*
  - *Roll out detector*
  - *Install SSD with three ladders (one sector) of upgraded electronics*
- *Run 11 – Installation during summer 2010*
  - *Roll out detector*
  - *Remove prototype electronics*
  - *Reinstall SSD with a full set of upgraded electronics*
  - *Commission detector*

**Assuming standard RHIC run scenario*

SSD Upgrade Proposal

- *Submitted proposal in the Fall*
- *Committee chaired by Rene*
- *Committee submitted report shortly after Quark Matter*
  - *Unseen by us*
  - *Understand favorable*
  - *Some homework for us*

∴ Status of Funding of the SSD Upgrade Proposal

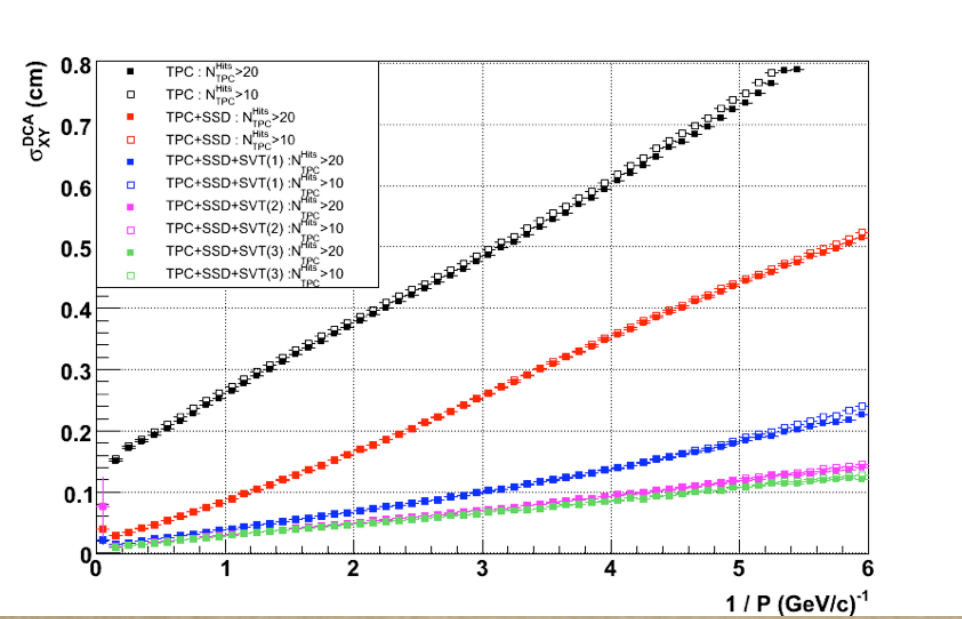
In limbo - June 17, 2008

Need Commitment

- *Nantes engineers are committed to the upgrade*
  - *Nevertheless, they have Nantes priorities*
  - *STAR should make an agreement with Nantes Management*
- *Start the engineering so that integration requirements are established*
- *Young scientists need to know that there is a real project*
- *STAR needs to make a commitment to the upgrade*

Analysis of Cu-Cu and Au-Au

- *Efficiency Cu- Cu good*
- *In data stream*
- *Will improve with a little work*
- *See talk by Jonathan Bouchet on Monday and Thursday*
- *Who will do Au-Au?*



Summary

- *SSD in physics data stream for Cu-Cu*
- *Need someone to finalize Au-Au analysis*
- *SSD silicon in good shape*
- *SSD ready to be brought back into STAR*
- *Upgrade plan to make the SSD compatible with DAQ1000 and the HFT*
- *Waiting for approval and funding for STAR*
- *Eager to join HFT upgrade*
- *Looking for people to join the SSD group*